

**Technical Review of the *Indoor Air Sampling Analysis and
Risk Characterization Report***
Former United Shoe Machinery Division North Parcel
181 Elliot Street, Beverly, MA
Dated May 24, 2013
EPA ID # MAD043415991
Mass DEP RTN 3-610

General Comments

1) A list of contaminants of concern (COCs) from the site assessment and remediation conducted in the 1980s would be useful. Please provide a list of COCs detected in both soils and groundwater.

2) The EPA's review of the indoor air sampling results and risk assessment identified the following issues. The risk assessment:

- is not comprehensive
- is not entirely site specific,
- does not provide cumulative risk,
- presents arguments to minimize the risk using a variety of approaches, but the data provided is insufficient to support the arguments presented, and
- did not achieve reporting limits that were less than the screening levels for multiple contaminants.

3) Despite the issues identified, the risk assessment is sufficient for a preliminary estimate of risk due to vapor intrusion. Based on the two sampling events, the Hazard Quotient is calculated at a value of less than one and therefore, the noncancer risks are not sufficiently high to require an immediate action (refer to specific comments 12 and 14, below).

4) The total cancer risk calculated is 2×10^{-5} for Suites 157-J and 149-J, and Buildings 600 and 500. The cancer risks are within EPA's risk range. EPA's policy is explained in OSWER Directive 9355.0-30, Role of the Baseline Risk Assessment in Superfund Remedy Selection Decisions, April 22, 1991. EPA uses the risk range of 10^{-6} to 10^{-4} as a "target range" within which EPA tries to manage risks as part of a site cleanup. Once a decision has been made to take an action, EPA has a policy to work towards a cleanup that will achieve a 10^{-6} risk or lower; however, EPA could accept a cleanup anywhere in the risk range. Factors that influence the determination of the appropriate risk include the presence of sensitive receptors. At this site the cancer risk is 2×10^{-5} ; however, the site contains two daycare facilities, two schools, and an adult daycare. Children are at a sensitive period of development for air exposures and adults in daycare could be expected to have respiratory or liver issues that may impair their ability to deal with excess indoor air contaminants.

<http://www.epa.gov/oswer/riskassessment/pdf/baseline.pdf>

5) To improve the risk assessment to more accurately reflect the current and future risk:

- Conduct additional rounds of indoor air sampling;
- Achieve reporting limits that are less than the screening levels;
- Refine the Conceptual Site Model (e.g., consider other potential sources, etc.); and
- Use more site specific exposure factors to improve the accuracy of the risk calculations.

Nine compounds exceeded the EPA's and MA DEP's residential screening levels. Consider evaluating whether it would be more cost efficient to improve the building ventilation, remediate with a sub-slab soil ventilation system, or revert back to the Activity and Use Limitations. Remediation may be more efficient than expending a lot of effort on collecting additional indoor air and soil gas sampling data to improve the site investigation and improve the risk assessment in order to make a final remedy decision. The limited soil gas sampling investigation that was conducted in order to eliminate the AUL appears insufficient or may not represent current conditions.

From the MassDEP Interim Final Vapor Intrusion Guidance, December 2011, "MassDEP recommends greater sampling frequency for more sensitive receptors. For daycares, schools, and residences, MassDEP recommends that at least two to four indoor air sampling rounds be conducted, depending on the degree of subsurface contamination, before determining that the vapor intrusion pathway does not exist. For commercial and industrial buildings, two indoor air sampling rounds are recommended to provide sufficient information to make decisions regarding vapor intrusion. In order to obtain an estimate of long-term conditions (chronic exposure), the sampling rounds should be obtained over at least two different seasons, one of which is winter."

6) There are 30 contaminants of concern that were detected in both indoor air and soil gas sampling. It is noted that sampling of these two media was not conducted concurrently as guidance recommends but several years apart. Guidance recommends concurrent sampling of groundwater, soil gas, and indoor air in order to evaluate the indoor air pathway using multiple lines of evidence. Because of the inherent uncertainty with the sampling and analytical and risk assessment processes for the indoor air pathway, a final remedy would likely require a more thorough evaluation of this pathway or remediation to eliminate the pathway.

7) Please submit the complete set of field notes for both sampling events.

8) Please provide documentation showing that a soil management plan was used when the parking garage was constructed and excavation in front lobby of building 100 was conducted.

Specific Comments

3.2 Air Sample Collection

1) For the previous indoor air sampling, please provide additional documentation on the placement of the canisters, including height. Canisters should be placed at a height that is representative of the typical breathing zone level of the children. Indoor air samples should be

collected in locations where children spend the majority of their day. Please provide copies of photographs showing canister locations.

2) If sample disturbance is a possible issue, sampling should take place on the weekends when the facilities are closed.

3) For any subsequent sampling events, consider the need for multiple canisters per school/day care. There are a number of factors that go into deciding how many and where samples need to be collected to effectively represent indoor air quality relative to the source of interest. The number of locations selected depends on factors such as, but not limited to: how the building is being used, who is occupying the building, whether there are any areas where soil gas can migrate into the building, where individuals spend most of their time and what the buildings HVAC system is and how it circulates air in the building.

5.0 Summary of Air Sampling Results

4) On page 11, cis-1,2-dichloroethylene is missing from the list of compounds “detected in indoor air and not in historic soil gas samples.” Please add this constituent to the list.

5) Page 11 contains the following statement:

“The primary site contaminants during site assessment and remediation conducted in the 1980s and 1990s consisted of chlorinated solvents and petroleum hydrocarbons. 11 compounds that had been detected in historic soil gas samples were not detected in the indoor air. Several of these 11 compounds are related to chlorinated solvents and/or their degradation products, most notably trichloroethylene, 1,1-dichloroethane, and 1,1-dichloroethene which were detected during the 1980s site assessment. As these compounds were not detected in indoor air in any of the sampling locations, this is an indication that vapor intrusion is not occurring within the buildings at the site.”

Contrary to the above statement, 28 constituents and all 3 APH fractions detected in both indoor air and soil gas may indicate that vapor intrusion is occurring.

Regarding the site assessment in 1980's discussed on page 11. The assessment included the installation of 139 groundwater monitoring wells, most of which were only sampled once. This line of evidence used in making decisions on vapor intrusion is lacking. Soil sampling in the 1980s was not as reliable as it is now with respect to identifying volatile organics due to the lack of standard operating procedures for preserving the samples; this line of evidence may also be lacking.

6) The site investigation should be improved by obtaining soil gas sampling data immediately following the additional rounds of indoor air sampling. In addition to sub slab sampling, sampling in the underground utility corridors, if accessible, would provide valuable information. Less expensive soil gas sampling can be conducted by locating cracks in the floors (may be

visible in utility closets and other areas that are not carpeted) and locations where utilities enter the building (vapor intrusion pathways).

7) The last paragraph on page 11 states that "...the majority of these compounds are not related to the petroleum and solvent compounds identified during the 1980's site assessment and appear to be unrelated to the former USM operations." A number of the compounds detected in indoor air are components of petroleum products (USM constituents of concern), including the trimethylbenzenes that were detected in both indoor air and soil gas.

Section 6.0 Risk Characterization

Section 6.2.3 Calculation of Exposure Dose, page 13

8) EPA prefers to see some supporting documentation or references for the parameters chosen for the calculation of exposure. The parameters should be as site specific as possible. EPA requires two risk calculations—one using central tendency parameters and a second using high end parameters. At a minimum, the calculations need the high end parameters because EPA makes decisions based upon the individual who experiences the Reasonable Maximum Exposure (RME).

9) The exposure frequency of 12 hours a day is unsupported. The value chosen appears greater than the central tendency; it is not clear how it relates to high end exposure.

10) The exposure duration of 250 days is unsupported although logical. If an employee works for 250 days per year would their child be in day care for the same number of days? The value chosen appears greater than the central tendency; it is not clear how it relates to high end exposure. For example, a representation of high end exposure based on data from the daycare facilities and schools at the site could be used here. If there is difficulty obtaining this site specific information due to privacy issues, published data from schools in Massachusetts could be used.

Section 6.2.4 Exposure Points and Exposure Point Concentrations, page 14

11) The use of one-half the detection limit is acceptable for the chemicals for which there was at least one detect in any of the data collected over the two sampling events. Given the limited sampling, it would be more appropriate to use the detection limit to represent the non-detect results for the seven chemicals that were never detected in the indoor sampling results and where the reporting limits exceeded the screening levels.

Section 6.4 Characterization of risk of Harm to Human Health

Section 6.4.1 Methodology, page 15

12) EPA guidance suggests that the Hazard Indices be separated by target organ or system. However, the Hazard Quotient would still be less than one.

Section 8.0 Conclusions and Recommendations

13) Page 22 of this section states the following, “While there was no evidence of storage of petroleum compounds during the pre-screening assessment in September 2012 in Suite 157-J, there are multiple commercial products that, if present at the space, could have resulted in the elevated levels detected in the air samples. For instance, the presence of cigarette smoke-related compounds on workers’ clothing could result in hydrocarbon detection in the air samples. If this statement is referring to the day care workers, they could be questioned as to whether or not they smoke and if so, sampling on a Saturday or Sunday may eliminate this questionable source. Alternately, or in addition, other possible sources to consider are (1) sub-slab vapor intrusion, (2) present or former underground storage tanks (3) adjacent suite usage of COCs (i.e., is there still an autobody shop and/or diesel mechanics shops in the north-east and north-west corners, respectively, of building 100?). Refer to attachment 1.

14) **Tables 3 to 7.** Please note that EPA guidance suggests the use of a sub chronic reference concentration (RfC) of 7×10^{-2} ug/m³ for 1,2,4-trimethylbenzene. This would result in a Hazard Quotient below one for this chemical.

15) **Tables 3 to 7.** The cancer risks may be slightly higher than calculated because ½ the detection limit was used where the RL was greater than screening level. Risk Assessment Guidance for Superfund, Part A (1989) states that other substitutions for non-detects can be used in the risk assessment (e.g., the detection limit). Given the limited indoor air data collected, the use of the detection limit rather than ½ the detection limit in the risk calculations for those chemicals where the RL was greater than the screening level would be appropriate. The rationale provided for including these chemicals in the risk assessment is sound.

Figures

16) Please provide a north arrow on figures 4-7.

17) Please revise figures 4 through 7 to show the entire day care/school facility floor plan and to be consistent with figure 3.

Additional Recommendations

18) The risk characterization looked at only one pathway of exposure. All risk assessments should be comprehensive and include all exposures and pathways for calculation of cumulative risk. Typically young children engage in a lot of hand to mouth activity so the incidental ingestion and dermal pathways must also be included in the risk assessment for a final remedy.

19) The impact of vehicle exhaust on the indoor air sampling should be considered and discussed in the report. In addition, other potential sources such as underground storage tank releases, and those more likely than “cigarette smoke on workers clothing” should be discussed. It would also be useful to include a discussion of what is typically found in indoor air and provide a complete reference to any such studies used in the discussion.

20) The reference location chosen for air sampling is likely contaminated with car exhaust and diesel exhaust from the commuter rail. It would be preferable to have at least one reference location that is not impacted by excessive exhaust. The car and train exhaust represent an alternative source of contamination rather than typical background. The grassy areas near the pond and buildings 500 and 600 would provide an alternate location impacted by anthropogenic background and less exhaust. In addition, a sample in this area is likely more representative of background conditions for buildings 500 and 600.

Another ambient outdoor air sample may be appropriate between building 100 and the gas station located off-site to the east of the Cummings Center.

21) Regarding the data evaluation for additional rounds of indoor air sampling, please include an analysis similar to what is provided in Attachment 2.

Appendices

22) On pages 67 of 74 and 75 of 82, custody seals on the canisters are noted as absent. Please clarify why. This could bring into question the integrity of the samples.

23) The chain of custody form shows that samples were relinquished by someone (name illegible) on 2/6/13 but not received until 2/7/13 (name and time illegible). This could bring into question the integrity of the samples.

24) Regarding the March 27, 2013 Memorandum from the lab on the field duplicate analysis (below), why wasn't the sample run again if it is possible there was an error with aliquot removal?

“It should be noted that acceptable RPDs for field duplicates are less than 40% for compounds whose detected values are greater than five times the estimated quantitation limit (EQL); and for compounds whose detected values are less than five times the EQL, value differences between the field sample and its associated duplicate are to be less than 2.5 times the EQL. Based on these criteria, the RPDs for the compounds listed above are acceptable except for 1,2,4-Trimethylbenzene, Acetone, Ethanol, Isopropyl Alcohol, m/p-Xylenes, Styrene, and C9-C12 Aliphatics. Of note is that based on the analysis results, the quantitative results for sample L1302224-02 were consistently lower than the results for sample L1302224-01, meaning there may have been a malfunction in the canister for L1302224-02 or in the sample aliquot removal in the laboratory allowing ambient air to dilute the collected sample. No significant issues with the canisters were noted in the field data or in the analytical analysis report.”

ATTACHMENT 1

Figure 5 Phase II Comprehensive Site Assessment June 1991

ATTACHMENT 2
Evaluation Completed by MassDEP